

### **Remarks**

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and the following remarks. Claims 1, 3-4, 6, 9-13, and 18-21 are pending in the application. Claims 2, 5, 7-8, 14-17 and 22-52 are canceled. Claims 1-4, 6, 8-13, and 18-21, and 40-41 are rejected. No claims have been allowed. Claims 1, 18, and 21 are independent. Claims 1, 9, 11-13, 18 and 21 have been amended.

### ***Cited Art***

The Action cites

Small et al., U.S. Patent No. 6,319,360 (hereinafter “Small”);

Hershey et al., U.S. Patent No. 4,154,899 (hereinafter “Hershey”);

Swerin et al., U.S. Patent Application No. 2004/0065423 (hereinafter “Swerin”);

Thibierge et al., U.S. Patent No. 6,630,056 (hereinafter “Thibierge”);

Imamura et al., U.S. Patent No. 5,948,511 (hereinafter “Imamura”); and

Nagamoto, Japanese Patent No. 2001-271295 (hereinafter “Nagamoto”).

### ***Claim Rejections under 35 U.S.C. § 112***

The Action rejects claims 4, 11-13, 18-22, and 40-41 under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding the Gurley density, we confirm that the pressure difference to cause airflow through a medium is standardized. Please see the attached Tappi Standard T 536 om-02, and, in particular, Appendix A of that attachment. A2.2 refers to a nominal air pressure of 3.03 kPa. Tappi is the leading association for worldwide pulp, paper, packaging and converting industries (see [www.tappi.org](http://www.tappi.org).)

As a result, claims 4 and 20 should sufficiently indicate, to one skilled in the art, a Gurley density based on an amount of time for the paper industry.

Therefore, it is respectfully submitted that rejection of claims 4 and 20 under 35 U.S.C. § 112, should be reversed.

Regarding claims 11-13 and 18, the language that concerned the Examiner has been deleted.

Regarding claims 21 and 40, claim 40 has been canceled. Claim 21 has been amended to clarify that certain wavelengths of light have increased transmission. Additionally, overall transmission of light is increased.

It is believed that all of the rejections under 35 USC § 112, second paragraph, have been traversed, as specified above. If there are any further concerns, the Examiner is encouraged to call the undersigned in order to expedite prosecution.

***Claim Rejections under 35 U.S.C. § 102***

The Action rejects claims 1-3, 6, 8, and 21-22 under 35 USC 102(b) as being anticipated by Small.

The Action rejects claims 18 and 19 under 35 USC 102(b) as being anticipated by Nagamoto.

Applicants respectfully submit the claims are allowable over the cited art. For a 102(b) rejection to be proper, the cited art must show each and every element as set forth in a claim. (See MPEP § 2131.01.) However, the cited art does not describe each and every element. Accordingly, applicants request that all rejections be withdrawn. Claims 1, 18, and 21 are independent.

The Examiner appears to have discounted a limitation in the claims requiring “at least one major surface configured to support a release coating” as not being a positive limitation. (See Office action, page 6).

In response, claim 1 has been amended to specify the amount of yellow dye and positively reciting a coating for resisting penetration of the release paper. The amount of yellow dye specified in the claim is specifically supported in the application at page 12, lines 1 and 2. Support for the coating can be found starting on page 7, line 15, and in particular, page 7, lines 16-19.

Small relates to mottled paper, not release paper. Mottled paper is typically high-end paper used for cards, such as birthday cards. The addition of a coating in claim 1 focuses the claim onto the particular application of release paper backings. One skilled in the art would not look to mottled paper for solutions related to release paper backings. Additionally, a coating of any material that resists penetration onto mottled paper would diminish the use of the paper for writing, as it would resist ink, rather than absorb ink.

Claim 18 was amended to include a yellow dye in particular quantities. Nagamoto makes no mention of using a yellow dye.

Claim 21 also includes a yellow dye and a coating. As Small does not include a coating, a rejection under 35 USC 102(b) must be reversed.

All other claims are dependent claims and should be in condition of allowance for the reasons stated above.

***Claim Rejections under 35 U.S.C. § 103(a)***

The Action rejects claims 4, 9-11, 13, 18, and 20 under 35 U.S.C § 103(a) as unpatentable over Small in view of Hershey.

The Action rejects claim 12 under 35 U.S.C § 103(a) as unpatentable over Small in view of Hershey and further in view of Swerin.

The Action rejects claims 1-3, 6, 8, and 21-22 under 35 U.S.C § 103(a) as unpatentable over Thibierge in view of Imamura.

The Action rejects claims 4, 9-11, and 13 under 35 U.S.C § 103(a) as unpatentable over Thibierge in view of Imamura and further in view of Hershey.

The Action rejects claim 12 under 35 U.S.C § 103(a) as unpatentable over Thibierge in view of Imamura in view of Hershey and further in view of Swerin.

The Action rejects claims 1-3, 6, 21-22, and 40-41 under 35 U.S.C § 103(a) as unpatentable over Nagamoto.

The rejections under 35 U.S.C § 103(a) are moot in view of the claim amendments. As discussed above, all claims now require a coating. Applicant's representative believes that the coating limitation of claim 1 takes away Small as an effective reference. Small relates to mottled paper and would not having a coating that restricts penetration, as it could negatively impact ink absorption rendering Small useless for its intended purpose. Therefore, any combination with Small no longer is justifiable. (See M.P.E.P § 2143.01(V) stating: "The proposed modification cannot render the prior art unsatisfactory for its intended purpose.")

For the same reasons that Small cannot be used as a reference, Thibierge should not be used. Thibierge relates to tracing paper (see title) suitable for writing. Claim 1, for example, requires using a coating that resists penetration. Such a coating would render Thibierge

unsatisfactory for its intended purpose, and as such, should not be the basis of a refusal under 35 U.S.C § 103(a).

The specific quantities of yellow dye added to the claims is not shown or suggested by any reference of record.

Therefore, the rejection under 35 U.S.C. § 103 should be reversed.

All other claims are dependent claims and should be in condition of allowance for the reasons stated above.

### *Interview Request*

If the claims are not found by the Examiner to be allowable, the Examiner is requested to call the undersigned attorney to set up an interview to discuss this application.

### *Conclusion*

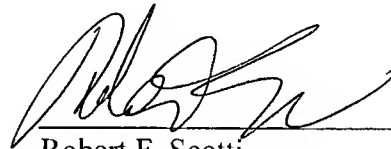
The claims in their present form should be allowable. Such action is respectfully requested.

Respectfully submitted,

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## T 536 om-02

PROVISIONAL METHOD – 1978  
CLASSICAL METHOD – 1985  
OFFICIAL METHOD – 1988  
REVISED – 1996  
REVISED – 2002  
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### CAUTION:

This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

## Resistance of paper to passage of air (high-pressure Gurley method)

### 1. Scope

1.1 This method is used to measure the air resistance of approximately 6.4 sq. cm. (1 sq. in.) circular area of paper using a pressure differential of approximately 3 kPa. The recommended range of this instrument is for papers that require 10 or more seconds for 10 mL of air to pass through. Refer to the manufacturer's instructions for the upper range limits. For more permeable papers, other techniques are preferable. Instruments are available with automatic timing devices.

1.2 This method measures the time it takes for a given volume of air to pass through the test specimen, along with any possible leakage of air across the surface; therefore it is unsuitable for rough-surface papers which cannot be securely clamped so as to avoid significant surface and edge leakage.

1.3 For a similar method of measuring air resistance that tests paper at a lower pressure (approx. 1.22 kPa), and has higher volume capabilities, refer to TAPPI T 460 "Air Resistance of Paper." For a similar method of measuring air permeance at pressures up to 9.85 kPa, using both smaller and larger test areas, refer to TAPPI T 547 "Air Permeance of Paper and Paperboard (Sheffield Type)."

### 2. Summary

This method measures the amount of time required for a certain volume of air to pass through a test specimen. The air pressure is generated by a gravity-loaded cylinder that captures an air volume within a chamber using a liquid seal. This pressurized volume of air is directed to the clamping gasket ring, which holds the test specimen. Air that passes through the paper specimen escapes to atmosphere through holes in the downstream clamping plate.

### 3. Significance

The air resistance of paper may be used as an indirect indicator of Z-directional fluid permeance, as well as other variables such as: degree of beating, absorbency (penetration of oil, water, etc.), apparent specific gravity, and filtering efficiency for liquids or gases. In electrical insulating papers, air resistance may be used in predicting dielectric strength. Air resistance is influenced by the internal structure and also the surface finish of the paper. Internal structure is controlled largely by the type and length of fibers, degree of hydration, orientation, and compaction of the fibers; as well as the type and amount of fillers and sizing. The measurement of air resistance is a useful control test for machine production; but due to the number and complexity of factors outlined above, careful judgment should be used in the specification of limits for air resistance.

### 4. Definition

Air resistance is the resistance to the passage of air, offered by the paper structure, when a pressure difference exists across the boundaries of the specimen. It is quantified by obtaining the time for a given volume of air to flow through a specimen of given dimensions under a specified pressure, pressure difference, temperature, and relative humidity.

### 5. Apparatus<sup>1</sup>

#### 5.1 Fluid Column Instruments

5.1.1 Air resistance apparatus, consisting of a vertically positioned outer cylinder which is partly filled with a sealing fluid, and an inner cylinder that can slide freely in the outer cylinder. Air pressure, generated by the weight of the inner cylinder, is applied to the specimen which is held between clamping plates. Refer to Appendix A.1 for the detailed description of apparatus designed specifically for using mercury for the sealing fluid, and Appendix A.2 for the detailed description of apparatus specifically designed for using oil for the sealing fluid.

**NOTE 1:** The mercury-type instrument is no longer manufactured. The oil-filled instrument described in this method is a direct replacement for the mercury-type instrument.

5.1.2 The clamping plates are located at the bottom of the apparatus, and a center feed tube directs the pressurized air to the clamping plates. The top of the floating inner cylinder is closed.

5.1.3 An elastomeric gasket is attached to the clamping plate on the side exposed to air pressure to minimize the leakage of air between the surface of the paper specimen and the clamping plate. The gasket is  $28.58 \pm 0.13$  mm inside diameter and  $34.93 \pm 0.13$  mm outside diameter. A satisfactory material is Thiokol, grade ST, polished plate molded, 0.8 mm thick, 50-60 IRHD International Rubber Hardness Degrees. Other materials may be recommended by the instrument manufacturer. Since the hardness of the elastomer will change with age, this gasket must be replaced on a periodic basis to ensure optimum sealing characteristics. For alignment and protection, the gasket is cemented in a groove machined in the clamping plate. The groove is concentric with the aperture in the opposing plate. The groove is  $28.45 + 0.000/-0.08$  mm inside diameter and  $35.18 + 0.08/-0.000$  mm outside diameter, at a depth of  $0.50 \pm 0.03$  mm.

5.1.4 A stopwatch or electric timer, capable of recording time to the nearest 0.1 second, is required. Some instruments are available with automatic timing devices.

#### 5.2 Electronic Instruments

5.2.1 Electronic instruments are available on the market that measure the flow rate of air through the specimen under a controlled pressure differential. Mathematical algorithms then determine the air permeance of the specimen.

5.2.2 The measurement area and gasket materials shall be equivalent in hardness and size to those specified for the fluid column instrument as discussed in section 5.1.3.

5.2.3 The electronic instrument shall be set-up and calibrated in accordance with manufacture's instructions.

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<sup>1</sup> Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list in the bound set of TAPPI Test Methods, or may be available from the TAPPI Quality and Standards Department.

**6. Materials**

- 6.1 Refer to Appendix A.1.3 for a description of the sealing fluid for the mercury-type instrument.
- 6.2 Refer to Appendix A.2.3 for a description of the sealing fluid for the oil-type instrument.

**7. Calibration**

7.1 The instrument can be tested for air leakage by clamping a thin piece of smooth, hard surfaced, airtight material such as metal shim stock (0.025 mm or thicker) between the clamping plates. A maximum leakage of 5 mL in 5 h is allowable for the mercury-type instrument, and 0.1 mL in 12 h is allowable for the oil-type instrument. This test does not ensure a similar low surface leakage for a paper specimen under test.

7.2 If the inner cylinder of the mercury-type instrument does not descend smoothly, the ball bearings probably need cleaning with a liquid such as alcohol. Refer to the caution statements regarding the handling of mercury.

7.3 Electronic timing devices should be checked in accordance with the manufacturer's instructions. Calibration flow restrictor plates will facilitate this test. Perform the calibration checks in accordance with the manufacturer's instructions.

**8. Sampling**

Obtain a sample of the paper in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product."

**9. Test specimens**

Prepare 10 test specimens of sufficient size from each test unit of the sample. A 50 mm square, or larger size, is generally adequate.

**10. Conditioning**

Condition and test the specimens in an atmosphere in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

**11. Procedure**

11.1 Place the instrument on a level surface, free of vibrations, so that the outer cylinder is vertical. Fill the outer cylinder with sealing fluid to the proper depth. The mercury filled model is filled with 907 g (2.00 lbs) of mercury. Refer to the manufacturer's instructions for filling the high-pressure oil version, as the technique is critical to the instrument performance.

11.2 Raise the inner cylinder before inserting the specimen in the test clamp until its rim is supported by the catch. Clamp the specimen between the clamping plates. Some versions use a hand-tightened capstan (jackscrew), while other versions are equipped with an eccentric cam lifting mechanism. Since the capstan version has no measurement or control of the clamping force, tighten with care in order to ensure proper specimen sealing. Over tightening, as well as under tightening, can cause erroneous results. Excessive clamping force may over stress the structural parts of the instrument and affect the parallel alignment of the upper and lower gasket surfaces. The eccentric cam lifting mechanism is actuated by turning one of the two knobs to the left or to the right of the lifting assembly. This self-locking design decreases the potential of using excessive clamping force. After the specimen is properly clamped, gently lower the inner cylinder until it floats.

**NOTE 2:** To avoid spilling the sealing fluid, raise the inner cylinder with no test specimen in the clamp area. Raise the cylinder slowly.

11.3 As the inner cylinder moves steadily downward, measure the number of seconds, to the nearest 0.1 s, required for the inner cylinder to descend from the 0 mL mark to the 10 mL mark, referenced to the rim of the outer cylinder.

11.4 For the mercury-type instrument, refer to Table 1 for the appropriate correction factors if displacement intervals other than the 0 to 10 mL marks are used. Multiply the measured time by the correction factors from Table 1 to

obtain a corrected result for the alternate interval. This will normalize the reading to the 0 to 10 mL interval. It may be expedient to use shorter intervals for relatively impervious papers. Also, instruments that use electronic timing devices may be adjusted to use different intervals.

**Table 1:** Correction factors to normalize readings to the 10 mL interval when alternate timing intervals are used for the mercury-type apparatus.

Scale Markers Used	Correction factor (multiplier)
0 to 10 mL	1.000
0 to 5 mL	2.028
0 to 2.5 mL	4.086

11.5 Test five specimens with the top side up, and test five specimens with the top side down.

## 12. Report

12.1 For each test unit, report the air resistance as the mean of the ten tests in seconds required for 10 mL cylinder displacement, to the nearest second, as "high-pressure method." Also record the highest and lowest observed values, plus any values rejected in accordance with TAPPI T 1205 "Dealing with Suspect (Outlying) Test Determinations."

12.2 Indicate on the report whether the mercury column or oil column instrument was used, and the timing interval if it was different from the 0 to 10 interval and normalized by using Table 1.

12.3 Report any deviation in the test procedure, such as testing specimens at different clamping areas or using cylinders of different weights that generate different pressures. Also, there may be a reason to test one side only of specimens that exhibit "two-sidedness" properties.

## 13. Precision

13.1 The following estimates of repeatability and reproducibility are based on data from the CTS-TAPPI Interlaboratory Program from 1996 through 2001. The materials on which this data is based were various grades and weights of coated printing papers and backing papers. Only participants that were judged as acceptable by the interlaboratory analysis were included. The precision estimates are based on 10 determinations per test result and 1 test result per lab, per material. A more detailed chart of example results is included below.

13.2 Repeatability (within a lab) = 6.3%

13.3 Reproducibility (between laboratories) = 14.6%

13.4 Repeatability and reproducibility are estimates of the maximum difference (at 95%) which should be expected when comparing test results for materials similar to those described above under similar test conditions. These estimates may not be valid for different materials or testing conditions.

13.5 The user of these precision data is advised that it is based on actual mill testing, laboratory testing, or both. There is no knowledge of the exact degree to which personnel skills or equipment were optimized during its generation. The precision quoted provides an estimate of typical variation in test results which may be encountered when this method is routinely used by two or more parties.

**Data Table of Air Resistance Results (Seconds/10mL)**

Grade	Grand Mean	Std Dev Btwn Labs	Repeatability r and %r		Reproducibility R and %R		Labs Included
Waxed	594	22	57	9.7%	60	10.1%	17
Coated	450	22	15	3.4%	61	13.6%	19
Freesheet							
Coated	210	9	7	3.4%	25	11.7%	22

## 15. Keywords

Air permeance, Air permeability, Air resistance, Density, Densitometer, Porosity



15. Additional information

15.1 Effective date of Issue: March 5, 2002.

15.2 The results of this test, when reported as seconds per 10 mL cylinder displacement, per 6.4 sq. cm. (1 sq. in.), are commonly referred to as "high density" Gurley seconds.

15.3 It is common practice for manufacturers of silicone release paper grades to use this equipment to measure the seconds per 2.5 mL and multiply that time value by a factor of 100 to obtain the approximate "equivalent oil Gurley seconds," as measured in the method described in TAPPI T 460. The factor of 100 is derived from the pressure being 2.5 times greater and the volume being 0.025 of the TAPPI T 460 method ( $2.5/0.025 = 100$ ).

15.4 The results of this test are sometimes reported as seconds per 100 mL of air per square inch "high density" Gurley porosity. Multiply seconds per 10 mL  $\times 10 = 100$  mL.

15.5 The relationship to air permeance (P), in micrometers per pascal second, referenced to the density at 2.8 kPa is:

$$P = \frac{5.569}{t}$$

where  $t$  = seconds per 10 mL cylinder displacement

15.6 There is another technique (1) in common usage that utilizes an electronic mass airflow meter to measure the outflow of air from a paper specimen that is subjected to a pressure differential of 3 kPa. By measuring the outflow (discharge of air) from the specimen, surface leakage does not bias the measurement. The test results are virtually identical to those obtained from the liquid column instrument when there is no surface leakage at the clamping rings of the liquid column instrument.

15.7 Related method: ASTM D 726, Method B.

15.8 Information concerning the hazards of mercury, disposal of mercury wastes, and handling of exposed surfaces can be found in TAPPI TIS 598-3 "Disposal of Mercury Wastes from Water Laboratories."

15.9 This revision contains a revised precision statement.

Appendix A

A.1 Parts specific to the apparatus that uses mercury as the sealing fluid.

A.1.1 The outer cylinder of the mercury-filled apparatus is 254 mm high with an internal diameter of 44.4 mm. Some models are equipped with two sets of steel ball bearings, eight balls per set, located 12.7 mm and 107.9 mm, respectively, from the top of the outer cylinder to act as a guide for low friction travel of the moveable cylinder. Other models use a sleeve bearing to guide the inner cylinder. It has a fluid level indicator to assist in adding the proper amount of sealing fluid.

A.1.2 The moveable inner cylinder of the mercury-filled apparatus is 238 mm high with an internal diameter of 25 mm and an external diameter of 25.4 mm. It weighs  $167.1 \pm 1$  g, and in operation it will produce a nominal air pressure of 3.03 kPa (12.20 inches water gauge referenced at 20°C). The cylinder is graduated in units of 5 mL and has a total range of 30 mL. Some cylinders are graduated in units of 2.5 mL for the first increment.

A.1.3 The sealing fluid is distilled technical quality mercury with a specific gravity of 13.54 at 20°C.

A.2 Parts specific to the apparatus that uses oil as the sealing fluid.

A.2.1 The outer cylinder of the oil-filled apparatus is 508 mm high with an internal diameter of 31.8 mm. It is equipped with a sleeve bearing at the top to act as a low friction guide for the moveable cylinder. It has a fluid level indicator to assist in adding the proper amount of sealing fluid.

A.2.2 The moveable inner cylinder of the oil-filled apparatus is 527.1 mm high with an internal diameter of 24.8 mm and an external diameter of 25.4 mm. It weighs  $167.1 \pm 1$  g, and in operation it will produce a nominal air pressure of 3.03 kPa (12.20 inches water gauge referenced at 20°C). The cylinder is graduated in units of 5 mL and has a total range of 30 mL. Some cylinders are graduated in units of 2.5 mL for the first increment.

A.2.3 The sealing fluid is a lubricating oil having a kinematic viscosity of 10 to 13 mm<sup>2</sup>/s (60-70 s Saybolt Universal) at 38°C and a flash point of at least 135°C. The specific gravity at 23°C must be between 0.86 and 0.89. A light spindle oil is suitable for this purpose.

A.3 In order to assess the buoyancy effect of the inner cylinder's descent into the liquid mercury seal, a pressure tap was placed into the test zone on the high-pressure side of the test specimen, using a mercury-type instrument that was available for such studies (2). While the nominal pressure specification is 3.03 kPa, the equation below shows that the buoyancy effects do affect the pressure as a function of the cylinder position. The instrument studied had a

peculiar transition diameter in the inside of the inner cylinder, whereby it contacted the mercury somewhere between the 15 and 20 mL mark. For the range from 0 to 15 mL displacement, where the presence of such a transition diameter would not affect the buoyancy force, the pressure is as follows:

Equation 1:  $P = 2.88 - (0.01595) \text{ mL}$

where:

$P$  = specimen pressure differential (kPa)

mL = cylinder graduation marking

**Literature cited**

1. Hagerty, G. A. and Walkinshaw, J. W., "Design of a Modern Air Permeability Instrument Comparable to Gurley-type Instruments," *Tappi Journal* 76 (2): 97 (1993)
2. Hagerty, G. A. and Walkinshaw, J. W., "Comparison of Air Permeability Measurements Among Commonly Used TAPPI Methods," TAPPI 1992 Process and Product Quality Conference Proceedings, page 73.

*Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Director of Quality and Standards.* ■